

Public Abstract

First Name:Karen

Middle Name:A.

Last Name:Kirby

Adviser's First Name:Steven W.

Adviser's Last Name:Keller

Co-Adviser's First Name:Jerry L.

Co-Adviser's Last Name:Atwood

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Title:From Carbon to Copper: Studies of Novel Nanomaterials

Nanotechnology is an area of science that has gained much interest within the past 10 years. In 2003, President George W. Bush created the National Nanotechnology Initiative and allocated over \$3.5 billion for research and development in the field of nanotechnology. Materials that are used in nanotechnology are often referred to as nanomaterials. Nanomaterials range in size from 1 to 100 nanometers. These materials have a wide range of applications, from media storage for computers and mp3 players to hydrogen storage, which will someday replace gasoline as fuel for automobiles. This research was focused on studying new nanomaterials for applications in the areas of gas storage and ion exchange. Gels of single-walled carbon nanotubes were made with organic solvents. The solvent was removed from the gels by freeze-drying to make a single-walled carbon nanotube foam. This foam is lightweight and has been shown to absorb methane at low temperatures. The foam could be useful in gas sorption research and may also have potential in strengthening polymer composites. The structures of seven different copper(I) and copper(II) compounds were also studied with the intention of learning more information toward the progress of crystal engineering. Crystal engineering involves making materials of a desired structure, which is difficult to do. Some of the effects that govern structure formation are known but the mechanisms are not well understood. The syntheses of these copper(I) and copper(II) compounds and the resulting structures were studied. Some of these compounds have demonstrated potential use in ion exchange reactions, which could be used to remove radioactive waste from the environment.